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This Week's Citation Classic®

Fraser D W, Tsai T R, Orenstein W, Parkin W E, Beecham H J, Sharrar R G, Harris J, Mallison G F, Martin S M, McDade J E, Shepard C C, Brachman P S & the Field Investigation Team. Legionnaires' disease: description of an epidemic of pneumonia. *N. Engl. J. Med.* **297**:1189-97, 1977.
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An explosive point-source epidemic of pneumonia caused by a previously unrecognized bacterium affected primarily persons attending an American Legion convention in Philadelphia in July 1976. Twenty-nine of 182 cases were fatal. Spread of the bacterium appeared to be airborne. [The *SCI*® indicates that this paper has been cited in over 360 publications since 1977.]

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This was not one of those studies conceived in the quiet of one's laboratory or office. Within 12 hours of the first call from Pennsylvania to the Centers for Disease Control (CDC) about a cluster of severe pneumonia cases in Legionnaires after a convention in a Philadelphia hotel, the investigation was a public phenomenon, which grew to involve hundreds of health workers.

While large, the epidemiologic investigation followed some well-developed patterns. An initial step was to identify cases and confirm that there was indeed an epidemic. Working with the Pennsylvania Department of Health, physician-epidemiologists from CDC first visited each patient hospitalized for pneumonia to gather firsthand information about the medical history and clinical appearance of the disease and to collect specimens of blood, urine, sputum, and other materials for culture and analysis. Thus, by the third day of the investigation, we knew roughly the scope of the epidemic and could design a reasonably efficient system for screening reports of additional suspected cases. The American Legion post commanders and detectives from the Philadelphia Police Department helped us obtain critical information from people who had been in the vicinity but did not fall ill, so we could compare their activities with those of the ill Legionnaires. These surveys showed that Legionnaires' disease tended to affect older men who were cigarette smokers. The outbreak was largely confined to one week at one hotel, but not just to Legionnaires. The pattern of illness suggested airborne spread that was particularly intense in the hotel lobby and on the adjacent sidewalk. The accompanying paper by McDade *et al.* showed that the agent was a novel gram-negative bacterium that was named *Legionella pneumophila*.[1] The work in these two papers gained us the Richard and Hinda Rosenthal Award of the American College of Physicians.

It was hard to determine who should be listed as an author on the paper, for literally hundreds of people made important contributions. Ted Tsai, just out of his pediatric residency, was in the first wave of field epidemiologists and worked through to the very end overseeing collection and analysis of all the clinical and epidemiologic information. Walt Orenstein organized the Federal team in Philadelphia. Bill Parkin, as Pennsylvania State Epidemiologist, oversaw the entire state contingent, and Bob Sharrar, as Philadelphia Communicable Disease Control Chief, did the same for city health workers. Jim Beecham and John Harris were the Federal epidemiologists stationed in Harrisburg and Philadelphia, respectively, and they continued the field investigation for several months. George Mallison, as an environmental engineer, and Stan Martin, as a statistician, directed those important elements of the investigation. Charles Shepard, who was chief of Joe McDade's laboratory at CDC, worked closely with him to discover the causative bacterium. Phil Brachman had overall responsibility for the investigation and consulted with me nightly (usually between 2:00 and 3:00 A.M.) throughout the work in Pennsylvania. Some of the others who were most important in the field work are listed as members of the "Field Investigation Team."

The paper is cited often because it is the first description of a multisystem disease that has subsequently been shown to affect 25,000-50,000 people per year in the US and to occur worldwide. Although 20 percent of untreated cases may be fatal, treatment with erythromycin (with or without rifampin) can lower this figure to 5 percent. Later studies by us and others showed that *L. pneumophila* is a member of a previously unknown group of bacteria that adapt well to warm water and can spread through the air (or otherwise) from contaminated cooling towers or potable water systems to cause outbreaks or individual cases.[2]

1. **McDade J E, Shepard C C, Fraser D W, Tsai T R, Redus M A, Dowdle W R & the Laboratory Investigation Team.** Legionnaires' disease: isolation of a bacterium and demonstration of its role in other respiratory disease. *N. Engl. J. Med.* **297**:1197-203, 1977. (Cited 400 times.)
2. **Thornsberry C, Balows A, Feeley J C & Jakubowski W,** eds. *Legionella*. Washington, DC: American Society for Microbiology, 1984. 371 p.

